



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 7
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

MAR 24 2010

Mr. Scott Totten, Acting Director
Water Protection Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
P. O. Box 176
Jefferson City, Missouri 65102

Re: Approval of Big River, Flat River Creek, and Shaw Branch TMDL

Dear Mr. Totten:

This letter responds to the Missouri Department of Natural Resources (MDNR) submission of a Total Maximum Daily Load (TMDL) document which contained TMDLs for lead, non-volatile suspended solids (NVSS) and zinc for Big River, Flat River Creek, and Shaw Branch. The document was originally received by the U. S. Environmental Protection Agency (EPA), Region 7, on October 1, 2008. Revisions were made to the original submittal and the final version was resubmitted on February 10, 2010.

MDNR submitted a TMDL document for Big River, Flat River Creek, and Shaw Branch which were identified on the 2008 Missouri § 303(d) List as impaired. This submission fulfills the Clean Water Act statutory requirement to develop TMDLs for impairments listed on a state's § 303(d) List. The specific impairments (water body segments and pollutants) are:

| <u>Water Body Name</u> | <u>WBID</u> | <u>Pollutant</u> |
|------------------------|-------------|---------------------|
| Big River | MO_2074 | lead |
| Big River | MO_2080 | lead and NVSS |
| Flat River Creek | MO_2168 | lead, NVSS and zinc |
| Shaw Branch | MO_2170 | lead and NVSS |

EPA has completed its review of the TMDL document with supporting documentation and information. By this letter, EPA approves the submitted TMDLs. Enclosed with this letter is the EPA Region 7 TMDL Decision Document summarizing the rationale for EPA's approval of these TMDLs. EPA believes the separate elements of the TMDLs described in the enclosed form adequately address the pollutant of concern, taking into consideration seasonal variation and a margin of safety. Although EPA does not approve the monitoring plan submitted by the state, EPA acknowledges the state's efforts. EPA understands that the state may use the

monitoring plan to gauge the effectiveness of the TMDLs and determine if future revisions are necessary or appropriate to meet applicable water quality standards.

EPA is currently in consultation under Section 7 of the Endangered Species Act with the U. S. Fish and Wildlife Service regarding these TMDLs. While we are approving these TMDLs at the present time, we may decide that changes to the TMDLs are warranted based upon the results of the consultation when it is completed.

We appreciate the thoughtful effort that MDNR has put into these TMDLs. We will continue to cooperate with and assist, as appropriate, in future efforts by MDNR to develop remaining TMDLs.

Sincerely,


for William A. Spratlin
Director
Water, Wetlands and Pesticides Division

Enclosures

cc: Mr. John Hoke
Missouri Department of Natural Resources

Mr. Paul Sanford
American Canoe/Kayak Association

Mr. Scott Dye
Sierra Club

Mr. John Simpson
KS Natural Resource Council



EPA Region 7 TMDL Review

TMDL ID: MO 2074
Document Name: BIG RIVER

State: MO

Basin(s): BIG RIVER, UPPER MISSISSIPPI-MERAMEC (BIG RIVER BASIN)

HUC(s): 07140104

Water body(ies): BIG RIVER, FLAT RIVER CREEK, SHAW BRANCH

Tributary(ies): BIG RIVER (2074), BIG RIVER (2080), FLAT RIVER CREEK (2168), SHAW BRANCH (2170)

Pollutant(s): LEAD, SUSPENDED SEDIMENT/SILTATION, ZINC

Submittal Date: 10/1/2008

Approved: Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

The TMDL document (eight TMDLs) for Big River, Flat River Creek, and Shaw Branch was formally submitted by the Missouri Department of Natural Resources (MDNR) in a letter received by the United States Environmental Protection Agency (EPA) on October 1, 2008. Revisions to the TMDL document were received from MDNR by e-mail on December 24, 2008, March 25, 2009, and February 10, 2010.

Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

Metals:

The impairment of these water bodies for lead and zinc are based upon the exceedance of the Missouri WQS for metals, 10 CSR 20-7.031(4)(B)1.

"Water contaminants shall not cause the criteria in Tables A and B to be exceeded. Concentrations of these substances in bottom sediments or waters shall not harm benthic organisms and shall not accumulate through the food chain in harmful concentrations, nor shall state and federal maximum fish tissue levels for fish consumption be exceeded."

In addition, Missouri WQS specifies how hardness will be calculated, 10 CSR 20-7.031(1)(Y).

"(Y) Water hardness. The total concentration of calcium and magnesium ions expressed as calcium carbonate. For purposes of this rule, hardness will be determined by the lower 25th percentile value of a representative number of samples from the water body in question or from a similar water body at the appropriate stream flow conditions."

Table A states:

"Current lead and zinc standards for the protection of aquatic life use are expressed in dissolved form. They are hardness dependent and calculated from the formulas shown below:

Dissolved Lead (DPb)

Acute = $e^{(1.273 \cdot \ln(\text{hardness}) - 1.460448)} \cdot (1.46203 - (\ln(\text{hardness}) \cdot 0.145712))$ = micrograms per liter (ug/L)

Chronic = $e^{(1.273 \cdot \ln(\text{hardness}) - 4.704797)} \cdot (1.46203 - (\ln(\text{hardness}) \cdot 0.145712))$ = ug/L

Dissolved Zinc (DZn)

Acute = $e^{(0.8473 \cdot \ln(\text{hardness}) + 0.884211)} \cdot 0.978$ = ug/L

Chronic = $e^{(0.8473 \cdot \ln(\text{hardness}) + 0.785271)} \cdot 0.986$ = ug/L"

Using the hardness value of 200 mg/L determined from the 25th percentile of 262 hardness records taken in the Big River Watershed, the criteria for dissolved lead and zinc are as follows:

Lead: 136 and 5 ug/L for acute and chronic respectively.

Zinc: 211 and 193 ug/L for acute and chronic respectively.

The TMDL target for metals will be based on the chronic criteria of 5 ug/L for dissolved lead and 193 ug/L for dissolved zinc. The chronic criteria was selected because the lower target will protect aquatic life from acute and chronic toxicity.

NVSS:

The impairment of these water bodies for NVSS are based upon the exceedance of the Missouri WQS general or narrative criteria, 10 CSR 20-7.031(3)(A), (C) and (G).

"(A) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits, or prevent full maintenance of beneficial uses.

(C) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor, or prevent full maintenance of beneficial uses.

(G) Waters shall be free from physical, chemical, or hydrologic changes that would impair the natural biological community."

Fifty-three TSS records collected in the upper watershed above all known tailings from May 1976 to September 1989 were used as reference data. They were assumed to represent the natural background of the watershed. The 75th percentile of the TSS reference data was 5 mg/L where any data below detection levels were assigned half the corresponding detection level. Therefore, for the purpose of this TMDL, the TSS target is set at 5 mg/L.

The beneficial uses of these water bodies are as follows:

Big River (WBID 2074):

- Irrigation
- Livestock and Wildlife Watering
- Protection of Aquatic Life (Warm-Water Fishery)
- Human Health Protection (Fish Consumption)
- Cool Water Fishery
- Whole Body Contact Recreation – A
- Secondary Contact Recreation
- Industrial

Big River (WBID 2080):

- Livestock and Wildlife Watering
- Protection of Aquatic Life (Warm-Water Fishery)
- Human Health Protection (Fish Consumption)
- Whole Body Contact Recreation – A
- Industrial

Flat River Creek (WBID 2168) and Shaw Branch (WBID 2170):

- Livestock and Wildlife Watering
- Protection of Aquatic Life (Warm-Water Fishery)
- Human Health Protection (Fish Consumption)
- Whole Body Contact Recreation – B

These water bodies are designated as impaired for the following:

- Protection of Aquatic Life (Warm-Water Fishery), all four segments
- Human Health Protection (Fish Consumption), all segments except Shaw Branch.

On the 2002 Clean Water Act (CWA) § 303(d) List, the impairment of sediment was changed to NVSS. On the 2004/2006 CWA § 303(d) List, the impairment of NVSS was changed to inorganic sediment.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

The modeling approach for the impaired segments contained within these watersheds consisted of creating a load duration curve (LDC) at the outlet of each of the four impaired segment's watersheds and determining the TMDL for each pollutant of concern at every flow probability. Existing load was calculated from flow and concentration records for the same day and site. Baseflow for this TMDL document was estimated using an automated baseflow program. When flow was not reported with water quality data, a synthetic outlet flow value was calculated using flow data from the United States Geological Survey (USGS) gaging station, USGS 07018500, at Byrnesville, Missouri.

Metals:

The LC is defined by the numeric water quality criteria for lead and zinc which are hardness dependent. The endpoint for dissolved lead and zinc are the chronic criteria for any flow. Because lead and zinc standards are hardness dependent and hardness varies over time and location, a unique hardness value was selected to determine the endpoints. The hardness value of 200 milligrams per liter (mg/L) was determined from the 25th percentile of 262 hardness records taken in the Big River Watershed.

Non-Volatile Suspended Solids (NVSS):

When the WQS is expressed as a narrative value, a measurable indicator of the pollutant may be selected to express the narrative as a numeric value. There are many quantitative indicators of sediment appropriate to describe sediment in rivers and streams such as total suspended solids (TSS), turbidity, and bedload sediment.

TSS was selected as the numeric target for NVSS because there are no NVSS data, but there are 461 records of TSS collected in the watershed. Theoretically, TSS equals volatile (organic) suspended solids (VSS) plus NVSS (mineral, non-volatile). Assuming that the ratio of VSS to NVSS is constant, then NVSS parallels TSS in amplitude, i.e., as TSS increases, so does NVSS. Therefore, for the purpose of this TMDL, TSS was used as a surrogate target for NVSS.

Table 1: Loading Capacity and Percent Reductions Needed to Reach the Loading Capacity in Each of the Four Watersheds at the 50th Percentile of Flow

| Impaired Water Body | Flow (cfs) | Pollutant of Concern | TMDL (kg/day) | Required Reduction |
|------------------------------|------------|----------------------|---------------|--------------------|
| Big River (WBID 2074) | 433 | Dissolved lead | 5.3 | 86% |
| Big River (WBID 2080) | 305 | Dissolved lead | 3.74 | 85% |
| Big River (WBID 2080) | 305 | TSS | 3736 | 99% |
| Flat River Creek (WBID 2168) | 15.4 | Dissolved zinc | 7.28 | 100% |
| Flat River Creek (WBID 2168) | 15.4 | Dissolved lead | 0.189 | 97% |
| Flat River Creek (WBID 2168) | 15.4 | TSS | 188.65 | 96% |
| Shaw Branch (WBID 2170) | 1.69 | Dissolved lead | 0.02 | 98% |
| Shaw Branch (WBID 2170) | 1.69 | TSS | 20.8 | 98% |

cfs = cubic feet per second, TMDL = LC, kg/day = kilograms per day, WBID = Water body identification number, TSS = total suspended solids

If the LC is met, these reductions will result in the protection of Warm Water Aquatic Life Fishery in Big River, Flat River Creek, and Shaw Branch, and human health protection for fish consumption in Big River and Flat River Creek.

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

A LDC was created at the outlet of each of the four impaired segments' watersheds to determine the TMDL for each pollutant of concern at every flow probability. A TMDL is the product of the pollutant of concern in mg/L, the expected flow at the corresponding probability as cubic feet per second (cfs) and a conversion factor (2.45) with the resulting load expressed in kilograms (kg) per day (1 kg = 2.2 pounds). Existing load is calculated from flow and concentration records from the same day and site and is plotted against the TMDL curve based on their flow probability. Baseflow for this TMDL was estimated using an automated baseflow program. When flow was not reported with water quality data, a synthetic outlet flow value was calculated using flow data from the USGS gaging station, USGS 07018500, at Byrnesville, Missouri.

Metals:

The target is the numeric water quality criteria for chronic toxicity of dissolved lead and zinc for aquatic life. There is a direct link between the target and each numeric criterion. Lead and zinc standards are hardness dependent and hardness varies over time and location. A representative hardness value of 200 mg/L was used to calculate the lead and zinc targets. This value was derived from the 25th percentile of 262 hardness measurements taken in the Big River Watershed. Basing the TMDL for metals on the chronic criteria will protect aquatic life use from both acute and chronic toxicity.

There are no numeric water quality criteria for lead and zinc associated with the Protection of Human Health – Fish Consumption designated use in the WQS. There are, however, fish tissue concentrations for these pollutants that have associated consumption advisory levels established by the Missouri Department of Health and Senior Services. Reductions in the quantity of suspended and dissolved lead and zinc within Big River and its tributaries is expected to decrease the concentrations of these metals available to bioaccumulate within resident aquatic species. Implementation of the reductions found in this TMDL to protect the aquatic life designated use are expected to reduce the magnitude and frequency of fish consumption advisories within the Big River Watershed over time.

NVSS:

The TMDL establishes a link to the narrative standard for the NVSS impairment of the aquatic life use. NVSS reduces aquatic habitat quality by smothering natural substrates (materials in the streambed), fish eggs, and aquatic invertebrate animals such as water insects, mussels, and crayfish.

TSS was selected as the numeric target for NVSS because there is no NVSS data, but there are 461 records of TSS collected in the watershed. Theoretically, TSS equals VSS (organic) plus NVSS (mineral, non-volatile). Assuming the ratio of VSS to NVSS is constant, then NVSS parallels TSS in amplitude, i.e., as TSS increases, so does NVSS. Therefore, for the purpose of this TMDL, TSS was used as a surrogate target for NVSS.

Fifty-three TSS records collected in the upper watershed above all known tailings from May 1976 to September 1989 were considered reference data and assumed to represent the natural background of the watershed. All values below detection were assigned half the value of the detection level. The 75th percentile of the TSS reference data is 5 mg/L, and was the value used to represent the natural background of the watershed. In addition, MDNR Environmental Services Program and the USGS collected most of the data to assess this watershed, and their laboratories use detection limits that are equal to or higher than 5 mg/L. This target is meant to represent suspended clean sediment free of any pollutants including metals.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

The Big River Mine Tailings/St. Joe Minerals Corporation site was placed on the EPA Superfund National Priorities List (NPL) in October 1992. Superfund non-time-critical removal actions are in various stages of planning and construction. Time-critical removal actions have been ongoing for several years.

The Big River, Shaw Branch, and Flat River Creek TMDL will be revised by MDNR in 2010 (*per MDNR website and email*) to incorporate new pollutants identified on Missouri's 2004/2006 303(d) List. The allocation of pollutant loads to particular sources, for the abandoned mine lands will be re-evaluated at that time.

Lead and/or zinc contamination is common in soils, groundwater, surface water and sediments on and surrounding lead and zinc mines, mills, and smelter sites, other process areas, and near transportation corridors from large surface piles of mine or mill wastes, underground mine workings that penetrate the shallow aquifer, dust fallout, and fugitive emissions.

Nonpoint sources are diffuse sources of pollutant loading that typically cannot be identified as entering a water body at a single location. These sources involve runoff from non-mining areas and may contribute lead and zinc to surface waters as a result of runoff-producing storm events. Some examples include off-site haul and access roads not constructed of waste rock or spent ore from mining areas. When compared to the mine land areas within the Big River watershed, nonpoint sources of lead, zinc, and TSS loading are expected to be minor. Undisturbed and vegetated areas within the watershed are expected to be insignificant sources of lead, zinc, and TSS to the impaired segments.

While nonpoint sources of dissolved lead and zinc are minor or negligible under critical low-flow conditions, historic and legacy lead and zinc within the stream system can be sources of these metals, especially during higher flows. As conservative pollutants, these metals do not degrade and historic lead and zinc can become re-suspended into the water column and carried downstream via natural fluvial processes. Significant metals suspension and re-deposition can occur during and immediately following high-flow storm events. This process allows previously unavailable lead and zinc to enter the water column and become a water quality concern as a secondary source of metals contamination.

Historic mining activity has left abandoned mine workings and tailings piles throughout the Big River Watershed. These locations constitute discrete areas of point source delivery of TSS, zinc and lead to the impaired segments. The following areas are known to contribute pollutant laden runoff of sediment and metals to the impaired segments:

- Erosion of lead tailings from the Federal tailings pond (St. Joe State Park)
- Erosion of lead tailings from the National pile, which adjoins the Flat River Glass Company
- Erosion of tailings and discharge of dissolved zinc from the Elvins pile
- Erosion of tailings directly from the Leadwood and Desloge tailings piles and tailings entering from Flat River Creek impair Big River
- Erosion of tailings from the Bonne Terre pile

Seepage of dissolved metals from the tailing piles listed above represent another potential secondary source of metals contamination to the impaired water bodies. As precipitation infiltrates tailing piles and moves through the subsurface, metals may become dissolved and enter gaining streams within the watershed via the groundwater recharge pathway. At present, the amount and extent of seepage as a secondary source of metals contamination is unknown.

The primary cause of impairment to these four water bodies has been identified as erosion from tailings. These tailings accumulate in pools within the water bodies which creates secondary sources of contaminated sediment. Big River is impaired by erosion of tailings directly from the Leadwood and Desloge piles and by tailings entering from Flat River Creek. Flat River Creek is impaired by erosion from the following erosion of tailings: the Federal tailings pile (St. Joe State Park), the National pile (which adjoins the Flat River Glass Company), and discharge of dissolved zinc from the Elvins pile.

One hundred and forty-three (143) National Pollutant Discharge Elimination System (NPDES)-permitted facilities are located within the watershed. These include 33 general permits (MOG), 12 storm water permits (MOR)- including two Municipal Separate Storm Sewer Systems (MS4s), 92 domestic wastewater treatment facility (WWTF) permits, and 6 site-specific, non-domestic wastewater treatment permits in the Big River Watershed (Table 2).

In addition, there are two (2) MDNR-established Applicable or Relevant and Appropriate Requirements (ARARs) for the Doe Run, Leadwood – Eaton Tailings Dam (MO-ARAR011) and Doe Run, Lead Belt Material

Company (MO-ARAR012) discharges. These ARARs only authorize discharges of storm water from these facilities under the Missouri Clean Water Law and NPDES. The remedial measures being taken are non-time critical removal actions under a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) consent order.

The submittal demonstrates that all known potential sources have been considered.

Table 2: NPDES Permits by Watershed WBID, MDNR NPDES Permit Number, Facility Name, and Design Flow (cfs). Facilities without design flows are labeled N/A or not applicable.

| Watershed WBID | MDNR Permit # | Facility Name | Design Flow (cfs) |
|----------------|---------------|----------------------------|-------------------|
| 2170 | MO0097993 | MDNR, ST JOE STATE PARK | 8.64 |
| 2168 | MO0022942 | BISMARCK WWTF | 0.25 |
| 2168 | MO0053180 | TOWN AND COUNTRY MHP | 0.015 |
| 2168 | MO0092134 | RUSTIC ACRES | 0.007 |
| 2168 | MO0092941 | SUGAR MAPLE COURT MOBILE | 0.008325 |
| 2168 | MO0097993 | MDNR, ST JOE STATE PARK | 0.01 |
| 2168 | MO0098647 | FLAT RIVER GLASS OPERATION | 1.2 |
| 2168 | MO0103560 | PARK HILL WWTF | 2.05 |
| 2168 | MO0123633 | NEW HOPE RESIDENTIAL | 0.002 |
| 2168 | MOG640065 | PARK HILLS WTP | N/A |
| 2168 | MOG821108 | W M PUMPING | N/A |
| 2168 | MOR040004 | FARMINGTON SMALL MS4 | N/A |
| 2168 | MOR23A113 | NPC BIDCO | N/A |
| 2080 | MO0001422 | VESELL MINERAL PRODUCTS | 0.5 |
| 2080 | MO0035700 | TERRE DU LAC NORTH | 0.24 |
| 2080 | MO0049000 | BISMARCK W STORMW | VARIES |
| 2080 | MO0057312 | TERRE DU LAC SOUTH LAGOON | 0.004 |
| 2080 | MO0058378 | COUNTRY HILL MHC | 0.011 |
| 2080 | MO0083810 | SHIRLEY SCHOOL | 0.00043 |
| 2080 | MO0084395 | GRANDVIEW PLAZA MHP | 0.007 |
| 2080 | MO0085111 | BELLEVIEW R-3 SCHOOL | 0.004 |
| 2080 | MO0086240 | BELGRADE R-6 ELEM SCHOOL | 0.003 |
| 2080 | MO0087025 | POTOSI ELKS CLUB #2218 | 0.001 |
| 2080 | MO0087181 | ROUGE CREEK UTILITIES, INC | 0.03 |
| 2080 | MO0087921 | KINGSTON K-14 SCHOOL | 0.005652 |
| 2080 | MO0089745 | SERENITY MHP | 0.002 |
| 2080 | MO0089893 | WHISPERING PINES MHP | 0.001 |
| 2080 | MO0090522 | SUMMIT ACRES MHP | 0.007 |
| 2080 | MO0090913 | LAKE KINIPPI SUBDIVISION | 0.005 |
| 2080 | MO0094242 | BELLEVIEW VALLEY NURSING | 0.014 |
| 2080 | MO0095311 | TERRE DU LAC OXIDATION DI | 0.25 |
| 2080 | MO0099431 | POTOSI WWTP #1 | 0.683 |
| 2080 | MO0099732 | POTOSI WWTF #2 | 0.21 |
| 2080 | MO0100706 | BONNE TERRE NW WWTF | 0.61 |
| 2080 | MO0101184 | BUCKMAN LABORATORIES INC | N/A |
| 2080 | MO0104256 | LEADWOOD WWTF | 0.15 |
| 2080 | MO0108774 | ST FRANCOIS CO ENVIR CORP | 1.2 |
| 2080 | MO0109568 | IRONDALE WWTF | 0.06 |
| 2080 | MO0110035 | THUNDERBIRD MHP | 0.004 |
| 2080 | MO0120260 | EAGLE ESTATES | 0.031 |
| 2080 | MO0121321 | BONNE TERRE NE WWTP | 0.9 |
| 2080 | MO0121371 | HUNTER'S RIDGE SUBDIVISION | 0.025 |

| | | | |
|------|-----------|----------------------------|----------|
| 2080 | MO0123544 | BATES CREEK BAPTIST CAMP | 0.00806 |
| 2080 | MO0123765 | VILLAGE TRAILER COURT | 0.003 |
| 2080 | MO0125083 | WEST ST. FRANCOIS CO R-IV | 0.012 |
| 2080 | MO0127388 | MOORE RECIRCULATING FILTR | 0.000975 |
| 2080 | MO0127922 | YMCA OF THE OZARKS | N/A |
| 2080 | MO0128571 | CALEDONIA WWTF | 0.02 |
| 2080 | MOG010259 | DAVID, KEN | N/A |
| 2080 | MOG010372 | DAVID, JOHN W | 0.069825 |
| 2080 | MOG490214 | LEAD BELT MATERIALS - QUA | VARIES |
| 2080 | MOG490230 | BIG RIVER MINE TAILINGS | VARIES |
| 2080 | MOG490356 | POLITTE READY MIX | N/A |
| 2080 | MOG490439 | POLITTE READY MIX | N/A |
| 2080 | MOG490736 | EGYPTIAN CONCRETE COMPANY | N/A |
| 2080 | MOG490805 | BASE ROCK MINERALS INC. | N/A |
| 2080 | MOG490807 | WASHINGTON CO. AGGREGATES | N/A |
| 2080 | MOG490947 | CIMBAR PERFORMANCE MINERA | N/A |
| 2080 | MOG500110 | WA CO MATERIALS | N/A |
| 2080 | MOG821031 | HAWK'S BACKHOE SERV, INC. | N/A |
| 2080 | MOG821067 | JONES PLUMBING SERVICE | N/A |
| 2080 | MOG821072 | RIDDLE SEPTIC CLEANING | N/A |
| 2080 | MOG821108 | W M PUMPING | N/A |
| 2080 | MOG821117 | WM PUMPING | N/A |
| 2080 | MOR22A137 | REED LUMBER COMPANY, LLC | N/A |
| 2080 | MOR23A062 | ORICA USA | N/A |
| 2080 | MOR240061 | R & M FEED | N/A |
| 2080 | MOR240227 | DICKEY FARM SUPPLY INC. | N/A |
| 2080 | MOR80C018 | BSC TRUCK INC. | N/A |
| 2080 | MOR80H010 | GILLIAM TRANSFER SOLID WA | N/A |
| 2074 | MO0040461 | MO AMERICAN, CEDAR HIL L L | 0.164 |
| 2074 | MO0043818 | GRANDVIEW R-2 SCHOOL DIST | 0.013 |
| 2074 | MO0044571 | COUNTRY AIRE MANOR MHP | 0.022 |
| 2074 | MO0044580 | HSSC, NORTHWEST HIGH SCH | 0.075 |
| 2074 | MO0045446 | LAKES OF DEERWOOD SUBD | 0.005 |
| 2074 | MO0049441 | STARLIGHT APTS. | 0.001 |
| 2074 | MO0053163 | OUR LADY QUEEN OF PEACE | 0.005 |
| 2074 | MO0053708 | LAKE ADELLE SEWER DIST | 0.05 |
| 2074 | MO0084450 | CREST MANOR MHP | 0.048 |
| 2074 | MO0085383 | HILLSBORO WW RECLAMATION | 0.5 |
| 2074 | MO0086363 | SYCAMORE GREEN ACRES MHP | 0.005 |
| 2074 | MO0086576 | BEL AIR ESTATES MHP | 0.012 |
| 2074 | MO0086932 | FISHER COMMERCIAL AREA | 0.001 |
| 2074 | MO0088951 | TRANSFORMATION CAMP | 0.002 |
| 2074 | MO0089354 | LAKE TAMARAC SUBD | 0.027 |
| 2074 | MO0090051 | PARADISE ESTATES MHP WWTF | 0.003 |
| 2074 | MO0090395 | EL CHAPARREL EST SUBD ASO | 0.017 |
| 2074 | MO0090905 | COUNTRY LIFE ACRES SUBD | 0.003 |
| 2074 | MO0090948 | GREEN ACRES MHP | 0.009 |
| 2074 | MO0092584 | GOLDEN ACRES MHP | 0.024 |
| 2074 | MO0092738 | MAPLE GROVE ELEM SCHOOL | 0.01 |
| 2074 | MO0098302 | CEDAR HILL FPD | 0.001 |
| 2074 | MO0099091 | ELDERLY HOUSING PRTRNSHP | 0.008 |
| 2074 | MO0099473 | RAINTREE PLANTATION | 0.064 |

| | | | |
|------|-----------|---------------------------|----------|
| 2074 | MO0099635 | JEFFERSON CO PWSD #2 | 0.092 |
| 2074 | MO0099635 | JEFFERSON CO PWSD #2 | 0.05 |
| 2074 | MO0100374 | HSSC, HOUSE SPGS MID SCH | 0.016 |
| 2074 | MO0100668 | HSSC, ECHO VALLEY EST | 0.018 |
| 2074 | MO0101893 | CAMP SUNNYHILL ADVENTURE | 0.0108 |
| 2074 | MO0101958 | JEFFERSON COUNTY LIBRARY | 0.012 |
| 2074 | MO0103233 | HSSC, BEAR CREEK ESTATES | 0.0421 |
| 2074 | MO0103438 | HSSC, WOODRIDGE ESTATES | 0.018 |
| 2074 | MO0103446 | COUNTRY TRAIL ESTATES MHP | 0.006545 |
| 2074 | MO0103551 | AUSTIN TRAILS | 0.002 |
| 2074 | MO0103799 | MO AMERICAN, SAND CREEK F | 0.075 |
| 2074 | MO0105201 | HSSC, PINE GROVE MANOR | 0.004 |
| 2074 | MO0105597 | SECLUDED FOREST SUBD | 0.009 |
| 2074 | MO0105856 | BYRNES MILL MHP | 0.125 |
| 2074 | MO0105970 | WEDGEWOOD VILLAGE-PLAT 2 | 0.023 |
| 2074 | MO0106577 | SENNA WOOD VILLAGE SUBD | 0.026 |
| 2074 | MO0106909 | HSSC, MEADOW BROOK ESTATE | 0.09 |
| 2074 | MO0108642 | HSSC, SYCAMORE SPGS MHP | 0.048 |
| 2074 | MO0109304 | HSSC, CEDAR SPGS ELEM SCH | 0.012 |
| 2074 | MO0110019 | PINE FORD VILLAGE MHP | 0.03 |
| 2074 | MO0111457 | FEED MY PEOPLE | 0.001 |
| 2074 | MO0113191 | SUNRISE ACRES SUBDIVISION | 0.002 |
| 2074 | MO0115223 | SEVEN SPRINGS/TWIN LAKES | 0.049 |
| 2074 | MO0115428 | BYRNES MILL SOUTH WWTP | 0.5 |
| 2074 | MO0120600 | ST MARTIN'S UNITED CHURCH | 0.0011 |
| 2074 | MO0123561 | MEADOWBROOK VALLEY ESTATE | 0.01 |
| 2074 | MO0124788 | HSSC, MILLER CROSSING WTF | 0.025 |
| 2074 | MO0126926 | HSSC, FISHER RD | 0.1 |
| 2074 | MO0127345 | WACO LANDFILL | 2.3 |
| 2074 | MO0129097 | PHILLIPS PROPERTY WWTF | 0.0006 |
| 2074 | MOG490169 | HOUSE SPRINGS QUARRY | N/A |
| 2074 | MOG490359 | ARNOLD READY MIX-CEDAR HI | N/A |
| 2074 | MOG490390 | CONCRETE RESOURCES INC - | N/A |
| 2074 | MOG490532 | AAA ZOELLNER MATERIALS IN | N/A |
| 2074 | MOG490998 | DRY CREEK MATERIALS INC. | N/A |
| 2074 | MOG500086 | DRY CREEK MATERIALS, INC. | N/A |
| 2074 | MOG821017 | KING SEPTIC SERVICE | N/A |
| 2074 | MOG821026 | WALLACH SEPTIC SERV, INC. | N/A |
| 2074 | MOG821055 | IMPERIAL PUMPING | N/A |
| 2074 | MOG821074 | O'BRIEN EXCAVATING | N/A |
| 2074 | MOG821096 | RITE NOW SEPTIC CLEANING | N/A |
| 2074 | MOG821116 | AA QUICK SEWER | N/A |
| 2074 | MOG821123 | BONACKER FARMS | N/A |
| 2074 | MOG822125 | DITTMER MEAT PACKING COMP | N/A |
| 2074 | MOG821126 | DON ROBINSON TRACT | N/A |
| 2074 | MOR040052 | JEFFERSON CO SMALL MS4 | N/A |
| 2074 | MOR60A080 | BIG 3 AUTO PARTS & SALVAG | N/A |
| 2074 | MOR80C333 | NORTHWEST R-1 SCHOOL DIST | N/A |
| 2074 | MOR80C429 | DURHAM SCHOOL SERVICES | N/A |

MHP = Mobile Home Park, WWTP = Wastewater Treatment Plant

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.

Metals:

The LC is defined by LDCs at the outlet of each of the four impaired segments' watersheds set at the chronic criteria of 5 ug/L for lead, and 193 ug/L for zinc, at a hardness value of 200 mg/L.

NVSS:

The LC is defined by LDCs at the outlet of each of the four impaired segments' watersheds and set at the TSS target of 5 mg/L. The TSS target is the representative value for the naturally occurring background concentrations set from the 75th percentile of reference data collected in the upper watershed above all known tailings.

WLA Comment

Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

The WLA for these TMDLs is set to the lesser of applicable water quality based or technology based effluent limits (TBELs).

In addition to the calculation of LDCs, MDNR calculated the largest percent reductions of existing loading necessary to meet TMDL loading targets within Big River (WBIDs 2074 & 2080), Flat River Creek (WBID 2168) and Shaw Branch (WBID 2170). These percent reductions are the largest calculated values for a given pollutant of concern from the LDCs, and it is expected that these reductions will be protective of WQS under all flow regimes (Table 3).

Table 3. Required Reductions of Existing Loading from LDCs for each Water Body

| Water Body (WBID) | Pollutant of Concern | Required Reduction |
|------------------------------|----------------------|--------------------|
| Big River (WBID 2074) | DPb | 86% |
| Big River (WBID 2080) | DPb | 85% |
| Big River (WBID 2080) | TSS | 99% |
| Flat River Creek (WBID 2168) | DZn | 100% |
| Flat River Creek (WBID 2168) | DPb | 97% |
| Flat River Creek (WBID 2168) | TSS | 96% |
| Shaw Branch (WBID 2170) | DPb | 98% |
| Shaw Branch (WBID 2170) | TSS | 98% |

DPb = dissolved lead, TSS = Total suspended solids, DZn = dissolved zinc

Existing inspection data for the 33 general and 12 storm water permits within the Big River Watershed suggest these permits are protective of the NVSS, lead, and zinc impairments. Because general and storm water permits within the watershed are not significantly contributing to the water quality impairments, the WLA for these permits is a zero percent net reduction in loading. WLAs for individual facilities covered by general and storm water permits within the watershed are set at current permit limits and conditions.

Included within the 12 storm water permits are two (2) MS4s with outfalls: Jefferson County Small MS4 (MO-R040052) discharges to Big River (WBID 2074), and City of Farmington Small MS4 (MO-R040004) discharges to Flat River Creek (WBID 2168). Existing inspection data indicate the outfall locations for these MS4 permits do not currently contribute pollutants of concern to the impaired water body segments. Should future inspection, assessment, or monitoring data indicate these MS4s contribute pollutants of concern to the impaired water body segments, the MS4 permits will be reopened to include requirements sufficient to characterize and reduce impacts from these discharges.

Currently there are 92 domestic WWTFs in the Big River Watershed. Mechanical WWTF standard secondary treatment permit limits are not to exceed a weekly average TSS concentration of 45 mg/L and a monthly average TSS concentration of 30 mg/L. Equivalent to secondary treatment for trickling filters is limited to a weekly average TSS concentration of 65 mg/L and monthly average TSS concentration of 45 mg/L, and for lagoons a weekly average of 120 mg/L and monthly average of 80 mg/L (10 CSR 20-7.015 (8)). However, treated domestic discharge is not considered to cause or contribute to the impairment of the water bodies addressed by this TMDL. Thus, the WLA for domestic facilities remains unchanged for NVSS and corresponds to zero percent net reduction in sediment load.

Six (6) site-specific, non-domestic wastewater treatment permits have been issued in the Big River Watershed (WBID 2074). Four (4) facilities are relevant to this study as they discharge pollutants of concern to the impaired water body segments. Transport of fine mineral sediment high in lead and zinc from the St. Francois County Environmental Corporation facility (a.k.a. Desloge tailings pile) and St. Joe State Park (a.k.a. Federal tailings pile) account for much of the point source metals and sediment loading to the impaired segments. The Vessel Mineral Products and Flat River Glass Operation facilities do not appear to be contributing appreciable amounts of metals and sediment. Federal regulations, 40 CFR 122.45(c), require that all permit limits for metals be expressed as total recoverable (TR) metals even though instream water quality targets may be expressed as dissolved metals.

All permitted facilities that are identified to contribute sediment and metals loading to impaired segments shall adopt appropriate best management practices (BMPs) to reduce such loading from their storm water outfalls. These facilities must also measure in-stream pollutant concentrations to determine the efficacy of the control measures.

During low-flow conditions, it is reasonable to allocate the entire LC of a pollutant as a WLA because of the lack of pollutant contributions from precipitation induced surface water runoff. If the facility WLA calculated as a percent reduction (Table 3) is greater than that required by the TMDL LDC during critical low-flow conditions, i.e., 95% flow exceedance, the greater reduction necessary to meet WQS was used.

Table 4: Non-Domestic Site-Specific Permits with Design Flow and Daily WLA for Each Site-specific, Non-domestic Wastewater Treatment Facility

| Watershed WBID | Facility Name | MDNR Permit Number | Design Flow (MGD) | TSS (kg/day) | PB TR (kg/day) | ZN TR (kg/day) |
|-------------------|---|-----------------------|----------------------|---------------------|-------------------------------|-------------------------------|
| 2080 | Vessel Mineral Products | MO0001422 | 0.5 | Shared 1,115 [1] | Zero percent net reduction | N/A |
| 2080 | St. Francois County Environmental Corporation | MO0108774 | 6.6 | | 1.11 | N/A |
| 2168 | Flat River Glass Operation | MO0098647 | 1.2 | 26 | Zero percent net reduction | Zero percent net reduction |
| 2170 | MDNR, St. Joe State Park | MO0097993 | 8.6 | LDC (see below) | | N/A |

MGD = million gallons per day, TSS = total suspended solids, PB TR = total recoverable lead, ZN TR = total recoverable zinc

[1] Because the Vessell Mineral Products and St. Francois County Environmental Corporation facilities both discharge TSS to Big River, the two facilities should share the loading capacity for TSS during low-flow conditions.

Vessell Mineral Products and Flat River Glass Operation are not significant contributors to lead and zinc; therefore, the lead and zinc WLAs for these facilities results in a zero percent net reduction in loading.

For the MDNR, St. Joe State Park facility, the TMDL LDC during critical low-flow conditions, i.e., 95% flow exceedance, were used to set WLAs in order to meet WQS. The MDNR, St. Joe State Park facility encompasses the entire Shaw Branch watershed and is the only permitted facility in the Shaw Branch watershed. Because all precipitation induced storm water runoff discharged into Shaw Branch is generated by and from the facility, the TMDL allocates the entire LC for dissolved lead and TSS to the MDNR, St. Joe State Park facility as WLAs under all flow conditions. For example, at the 50th percentile of flow, the WLA for dissolved lead is 0.02 kg/day and for TSS is 20.8 kg/day.

The ARARs established for the Doe Run, Leadwood – Eaton Tailings Dam and Doe Run, Lead Belt Material Company discharges require once per month monitoring for TSS, total recoverable and dissolved lead and total recoverable and dissolved zinc, but sampling has not yet occurred. MDNR has requested Doe Run Corporation initiate sampling under the terms of the established ARARs and submit the results to the MDNR Water Protection Program. If the sampling results indicate the ARAR facilities discharge pollutants of concern at levels that will cause or have the reasonable potential to cause or contribute to an in-stream excursion above WQS, WLAs will be included in the ARARs to ensure protection of designated uses. WLA development will target the TMDL target water quality criteria.

While a WLA has been calculated for point sources, including any unpermitted abandoned mines or tailings piles, any allocation does not reflect an authorization to discharge from an unpermitted point source. Discharging pollutants to waters of the state without a permit is a violation of both state and federal Clean Water Law. Should it become necessary to permit currently unpermitted abandoned mines or tailings piles, those areas must follow the Department's permit application and antidegradation processes and will be evaluated in light of this TMDL.

These WLAs will ensure the permitted facilities will not cause or contribute to the NVSS, lead, or zinc impairment.

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources

are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

The LA for all impaired water body segments and pollutants of concern is set at the remainder of the LC after the WLA is subtracted. Where no permitted facilities exist within the watershed that will contribute to the impairment, the WLA is zero and the entire LC for that pollutant was allocated as a LA. Because the MDNR, St. Joe State Park facility encompasses the entire Shaw Branch watershed, all precipitation induced storm water runoff is generated by and from the facility. Therefore, the entire LC for each pollutant was allocated to the MDNR, St. Joe State Park facility as WLAs under all flow conditions.

Table 5: Example LA at the Load Duration Curve 50th Percentile Flow Probability for Each Impaired Water Body and Pollutant of Concern

| Water Body (WBID) | Pollutant of concern | Flow (cfs) | TMDL (kg/d) | WLA (kg/d) | LA (kg/d) |
|------------------------------|-------------------------|---------------|----------------|---------------|--------------|
| Big River (WBID 2074) | DPb | 433 | 5.3 | 0 | 5.3 |
| Big River (WBID 2080) | DPb | 305 | 3.74 | 1.11 | 2.63 |
| Big River (WBID 2080) | TSS | 305 | 3736 | 1115 | 2621 |
| Flat River Creek (WBID 2168) | DZn | 15.4 | 7.28 | 0 | 7.28 |
| Flat River Creek (WBID 2168) | DPb | 15.4 | 0.189 | 0 | 0.189 |
| Flat River Creek (WBID 2168) | TSS | 15.4 | 188.65 | 26.0 | 162.65 |
| Shaw Branch (WBID 2170) | DPb | 1.69 | 0.02 | 0.02 | 0 |
| Shaw Branch (WBID 2170) | TSS | 1.69 | 20.8 | 20.8 | 0 |

DPb = dissolved lead, DZn = dissolved zinc

Margin of Safety

Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.

For the eight TMDLs contained within this TMDL document, the MOS is implicit and derived from the following conservative assessments. The first conservative assessment during the TMDL calculations was that the downstream watershed outlet flow was assigned to any water quality site missing flow data. This results in an over-estimation of load since load is a product of flow and concentration, and flow at the downstream assigned watershed outlet is greater than what the actual unrecorded flow would have been. The second conservative assessment is the LDC targets the chronic criteria for lead and zinc which will protect for acute and chronic toxicity of aquatic life. The third conservative assessment is that when establishing WLA and LAs, the greater percent reduction required for the water body or TMDL loading was used to set allocations in order to meet WQS.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

The LDC represents flow under all possible stream conditions which accounts for seasonal variations. Seasonal variation is therefore implicitly taken into account within the TMDL calculations. The advantage of this approach is that it avoids the constraints associated with using a single-flow critical condition.

While there is significant seasonal variation in the amplitude of the average flow and concentrations of the parameters of concern (see TMDL, Table 19), such variation would not require special consideration in these TMDLs because implementation to reduce loading would be applicable all year round.

Public Participation

Submittal describes required public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

The TMDL document was first placed on a 30-day public notice from December 20, 2006, through January 19, 2007. Comments were received from EPA and the Missouri Coalition for the Environment. In response to these comments, MDNR made several changes to the document. Because of substantial revisions, the TMDL was placed on another 30-day notice from September 24 to October 24, 2007. Groups that received the public notice announcement included the Missouri Clean Water Commission, the four facilities with site specific permits, the Water Quality Coordinating Committee, the new citizen's Big River watershed group, 137 Stream Team volunteers in the watershed and 11 state legislators representing the Big River Watershed. Also, the public notice, Information Sheets, and the TMDL were posted on the MDNR Web site making them available to anyone with access to the Web. Any comments received and MDNR's response to those comments have been placed in the Big River TMDL file.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

Currently, USGS conducts water quality monitoring on Big River near Richwood (USGS 07018000). USGS monitoring includes daily average discharge, twice a year sampling for metals, and six times a year sampling for water chemistry. MDNR considers the monitoring frequency and analytes collected by the USGS sufficient to characterize water quality in Big River and should be continued. In addition to monitoring conducted by USGS, MDNR will continue monitoring the impaired waters covered by this TMDL for pollutants of concern. Additional monitoring of sediments and pore water may be conducted to determine the effectiveness of sediment BMPs and to assess water quality trends against probable effects levels, general criteria [10 CSR 20-7.031(3)], and water quality criteria for lead and zinc.

Facilities that have been determined to cause or contribute to sediment and/or metals loading to impaired segments will be required to measure in-stream pollutant concentrations to determine the effectiveness of their control measures. Facilities covered by ARARs must monitor and report analytical results for all pollutants of concern identified in the ARAR document. Entities covered by MS4 permits shall monitor and report the loading of pollutants of concern from their discharges.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.

No reasonable assurance is required because there is not a required reduction in LA to account for the prescribed WLA. Within the Big River Basin there are currently 143 NPDES-permitted discharging facilities for which MDNR has authority to write and enforce State Operating Permits, and two ARARs where MDNR has reviewed state laws and regulations in order to determine and establish the ARARs. Sufficient WLAs have been assigned to those point sources discharging pollutants of concern to account for their point source contributions to metals and sediment. Inclusion of effluent limits (determined from the WLA established by the modeling) into a state permit, and at least quarterly monitoring of the effluent reported to MDNR, will result in compliance with WQS met.